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Title: Water Quality Assessment for the Development of Total Maximum Daily Loads for Ammonia-Nitrogen in Garrett City Ditch in Dekalb County

Sample Matrix: Water (X); Sediment (); Fish Tissue ()

Location: Maumee River Basin

Hydrologic Unit Code: 04100003

Section: Environmental Toxicology and Chemistry Section

Author and Title: Julie Buening, Environmental Scientist III

Abstract or Summary: The purpose of this study was to assess the water quality of Garrett City Ditch for ammonia-nitrogen. Garrett City Ditch is on the 303 (d) list of impaired waterbodies for ammonia-nitrogen. In 2000, the ammonia-nitrogen results from three sampling events showed no water quality standard (WQS) violations. The recommendation for Crawford Ditch is to delist the stream for the ammonia-nitrogen parameter.

Keywords: TMDL, Garrett City Ditch, Ammonia-Nitrogen

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Water Quality Assessment for the Development of Total Maximum Daily Loads for Ammonia- Nitrogen in Garrett City Ditch in Dekalb County

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INTRODUCTION

Garrett City Ditch begins at the Garrett Wastewater Treatment Plant in Dekalb County, and flows east to Cedar Creek. The stream is about 3 miles in length. The 7Q10 low-flow for the Garrett City Ditch is zero.

Section 303 (d) of the Clean Water Act requires; states to develop lists of impaired waters needing total maximum daily loads, establish priorities for their development according to the severity of the pollution, and determine the uses to be made of the waters. A TMDL is a tool used for establishing waste load allocations (WLA) and load allocations (LA) from all contributing point and nonpoint sources in targeted watersheds. Garrett City Ditch is included on the Office of Water Management's 1998 303 (d) list of impaired waterbodies for ammonia-nitrogen. Garrett City Ditch is in the Great Lakes Basin area and since 1997, under the Great Lakes Initiative (GLI), has applicable water quality standards for ammonia-nitrogen. In 2000, a work plan was developed to supplement the sampling and analysis event that occurred in 1992.

METHODS

Sampling Sites and Locations

An initial water quality assessment consisted of 5 sites: two at the Garrett City WWTP, one on CR 15, one on CR 19, and one on SR 427 (Figure 1). Three sampling events were conducted between July 12 and November 15, 2000. Samples were collected at the following sites during each event from 8:30 a.m. to 2:30 p.m.

Site #	Stream Name	Location	Latitude Longitude
LEJ090-0012	Garrett City Ditch	Garrett WWTP at effluent	N 41 ⁰ 21' 25.4" W 85 ⁰ 7' 45.8"
LEJ090-0016	Garrett City Ditch	Garrett WWTP below Mixing Zone	N 41 ⁰ 20' 25.4" W 85 ⁰ 7' 45.8"
LEJ090-0013	Garrett City Ditch	CR 15	N 41 ⁰ 20' 20.34" W 85 ⁰ 7' 3.63"
LEJ090-0014	Garrett City Ditch	CR 19	N 41 ⁰ 20' 27.76" W 85 ⁰ 5' 54.53"
LEJ090-0015	Garrett City Ditch	SR 427	N 41 ⁰ 20' 13.33" W 85 ⁰ 4' 11.7"

Sample Collection

All 5 surface water locations were sampled three times for ammonia-nitrogen. The Water Quality Standards (WQS) for ammonia-nitrogen depend on the water temperature and pH of the stream (327 IAC 2-1.5-8). All of the ammonia-nitrogen samples were taken to the Indiana State Department of Health (ISDH) for chemical analysis for ammonia-nitrogen. Duplicates and field blanks were also collected for Quality Assurance/Quality Control

(QA/QC). Specific information about the measurement of ammonia-nitrogen in water samples is listed below.

Parameter	Preservative	CRQL	Units	Container Type	Holding
Ammonia-N	H ₂ SO ₄ to pH < 2, 4 ⁰ C +/- 2 ⁰	0.01	mg/L	1000 mL, glass, narrow mouth	28 days

Protocol Deviations

Two modifications to the original Work Plan occurred during the field season.

1. No general chemistry and nutrients or flow measurements were sampled and analyzed during the three sampling events.
2. Due to scheduling constraints, the third and final sampling event occurred after the October 31st.

RESULTS

Ammonia-Nitrogen

The ammonia-nitrogen results for pH and temperature from each sampling event and the WQS for ammonia-nitrogen are listed in Table 1. The ammonia-nitrogen results from the first, second, and third sampling events at measured water temperature and pH did not show any WQS violations.

Field Measurements

In conjunction with the analytic sampling at each site, standard field parameter measurements were taken using the YSI™ multi-parameter water-chemistry analysis unit. These parameters include pH, dissolved oxygen (DO), turbidity, percent saturation, specific conductivity, water temperature, chloride, and chlorophyll. Field measurements data from the first, second and third sampling events is presented in Table 2. Weather conditions and field observations made at each sampling site were also noted on the IDEM “Stream Sampling Field Sheet”.

DISCUSSION

No WQS violations were found for ammonia-nitrogen on all 5 of the sampling sites during the first, second, or third sampling events.

RECOMMENDATIONS

The recommendation for Garrett City Ditch is to delist the stream for ammonia-nitrogen. The ammonia-nitrogen results from all three sampling events were below the WQS, indicating that Garrett City Ditch is not impaired for ammonia-nitrogen.

Table 1
Ammonia-Nitrogen Results

<u>Site Description</u>	<u>IDEM #</u>	<u>Site #</u>	<u>Date Sampled</u>	<u>NH3-N</u> (mg/L)	<u>pH</u>	<u>Temp</u> (°C)	<u>CCC</u> (mg/L)	<u>WQS</u> <u>Violation</u>
Sampling Event -- 1								
Garrett WWTP at effluent	AA00374	LEJ090-0012	07/12/2000	0.1	7.56	20.39	2.0770	NO
Garrett WWTP below mixing zone	AA00375	LEJ090-0016	07/12/2000	0.1	7.63	19.93	2.0850	NO
County Rd 15	AA00376	LEJ090-0013	07/12/2000	0.1	8.23	21.95	0.7677	NO
County Rd 19	AA00377	LEJ090-0014	07/12/2000	0.1	7.99	6.34	1.3930	NO
State Rd 427	AA00379	LEJ090-0015	07/12/2000	0.1	8.62	24.83	0.3561	NO
Sampling Event -- 2								
Garrett WWTP at effluent	AA01597	LEJ090-0012	09/13/2000	1.8	7.45	21.13	2.0659	NO
Garrett WWTP below mixing zone	AA01599	LEJ090-0016	09/13/2000	0.8	7.23	19.59	2.0666	NO
County Rd 15	AA01600	LEJ090-0013	09/13/2000	0.6	7.15	20.19	2.0598	NO
County Rd 19	AA01601	LEJ090-0014	09/13/2000	0.3	7.26	20.53	2.0608	NO
State Rd 427	AA01602	LEJ090-0015	09/13/2000	0.3	7.38	21.38	2.0608	NO
Sampling Event -- 3								
Garrett WWTP at effluent	AA03056	LEJ090-0012	11/15/2000	0.4	8.09	13.77	1.0564	NO
Garrett WWTP below mixing zone	AA03057	LEJ090-0016	11/15/2000	0.2	8.12	12.11	0.9968	NO
County Rd 15	AA03058	LEJ090-0013	11/15/2000	0.2	7.4	9.6	2.2077	NO
County Rd 19	AA03059	LEJ090-0014	11/15/2000	0.1	7.99	6.34	1.3930	NO
State Rd 427	AA03060	LEJ090-0015	11/15/2000	0.1	8.18	5.33	0.9204	NO

Table 2
Garrett City Ditch Field Measurements Data

Site Description	Site #	IDEM #	Date Sampled	Dissolved Oxygen (mg/L)	pH	Water Temp (°C)	Specific Conductivity (uS/cm)	Turbidity (NTU)	% Saturation (mg/L)	Chloride (mg/L)	Chlorophyll (mg/L)
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Sampling Event -- 1

Garrett WWTP at effluent	LEJ090-0012	AA0034	07/12/2000	7.53	7.56	20.39	2533	1.4	84.4	*	2.2
Garrett WWTP below Mixing Zone	LEJ090-0016	AA00375	07/12/2000	7.76	7.63	19.93	2437	1.1	87	*	3.4
CR 15	LEJ090-0013	AA00376	07/12/2000	16.02	8.23	21.95	2297	5.5	183	*	79.4
CR 19	LEJ090-0014	AA00377	07/12/2000	10.79	7.78	22.47	2244	13.7	125.3	*	5.1
SR 427	LEJ090-0015	AA00379	07/12/2000	16.07	8.62	24.83	2049	4.5	197	*	6.7

Sampling Event -- 2

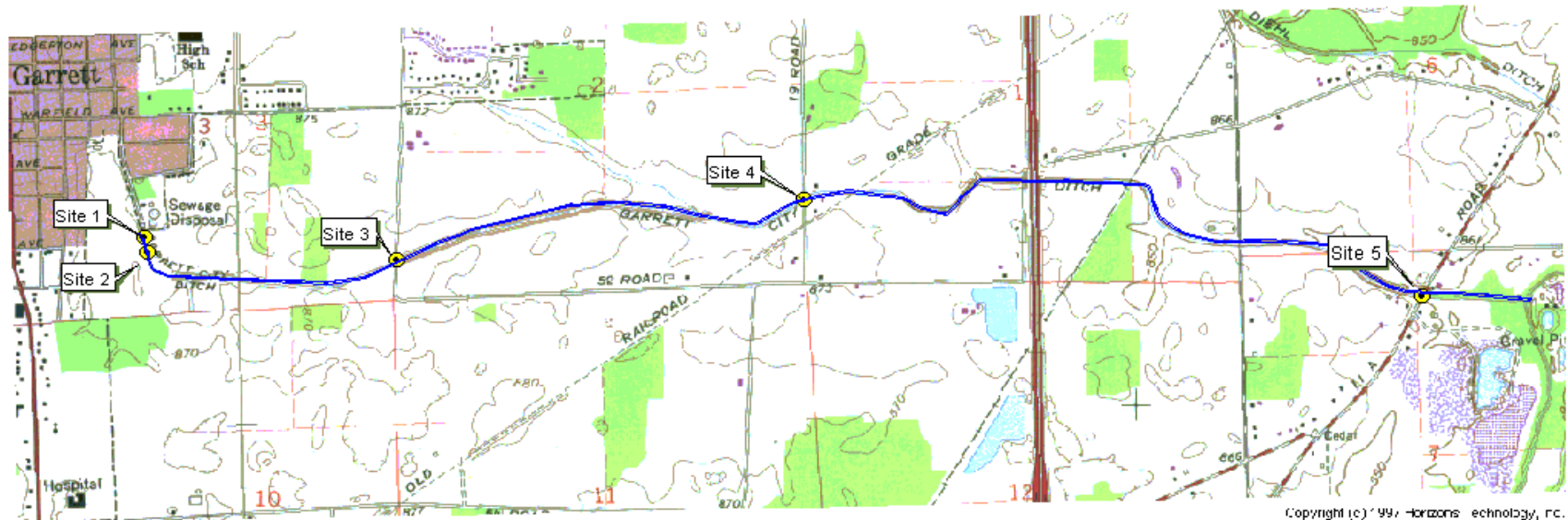
Garrett WWTP at effluent	LEJ090-0012	AA01597	09/13/2000	8.26	7.45	21.13	805	9.8	93	83.87	5
Garrett WWTP below Mixing Zone	LEJ090-0016	AA01599	09/13/2000	8.22	7.23	19.59	681	115	88.9	55	19
CR 15	LEJ090-0013	AA01600	09/13/2000	8.92	7.15	20.19	656	69.7	97.7	39	22
CR 19	LEJ090-0014	AA01601	09/13/2000	9.25	7.26	20.53	569	80.4	103	31	18
SR 427	LEJ090-0015	AA01602	09/13/2000	9.39	7.38	21.38	562	85	106.5	27	17.6

Sampling Event -- 3



Garrett WWTP at effluent	LEJ090-0012	AA03056	11/15/2000	7.45	8.09	13.77	1345	9.3	71.3	*	*
Garrett WWTP below Mixing Zone	LEJ090-0016	AA03057	11/15/2000	8.83	8.12	12.11	1047	9.1	81.9	*	*
CR 15	LEJ090-0013	AA03058	11/15/2000	9.45	7.4	9.6	1017	12.2	83.1	*	*
CR 19	LEJ090-0014	AA03059	11/15/2000	9.12	7.99	6.34	919	21	74.1	*	*
SR 427	LEJ090-0015	AA03060	11/15/2000	10.86	8.18	5.33	519	13.4	86	*	*

* For the first and third sampling events, no field measurements for chloride were taken; and in the third sampling event no field measurements for chlorophyll were taken.

Figure 1
Site Map of Garrett City Ditch



Legend

 **Garrett City Ditch**
 **Garrett City Ditch Sites**

- Site 1: LEJ090-0012 (Garrett WWTP effluent)
- Site 2: LEJ090-0016 (Garrett WWTP mixing zone)
- Site 3: LEJ090-0013 (CR 15)
- Site 4: LEJ090-0014 (CR 19)
- Site 5: LEJ090-0015 (SR 427)

